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File Code: 3420 **Date:** September 27, 2007
Route To: (2400)

Subject: Insects and Disease Conditions in CEEMS Silvicultural Certification Stand

To: Andy Stevenson, Silviculturist, Coconino National Forest

I recently met with you to view and discuss pathogens and insects present in your CEEMS certification stand. The 80 acre stand is located in the Jack Smith/Schultz Fuel Reduction and Forest Health Project Assessment Area, north of Flagstaff. The area has moderate to dense tree stocking levels and is dominated by blackjack ponderosa pine with lower levels of large yellow pines and sapling sized trees (figure 1). This letter describes our observations and provides technical information on the biology, ecology, and management of the pathogens and insects of concern.

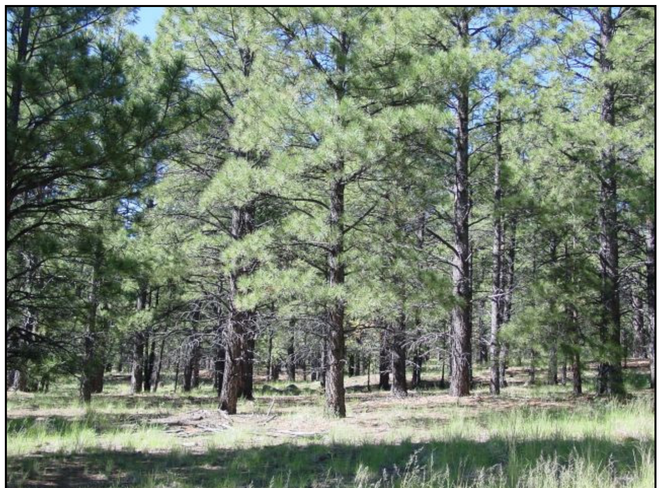

Figure 1 This stand is dominated by mid-sized ponderosa pine.

Current Insect and Disease Activity

There is no prominent insect or disease-pathogen causing significant growth loss and/or mortality in the certification stand. There are a few acres of ponderosa pine infected with southwestern dwarf mistletoe, and most is located in the northwest corner of the stand. Infection levels appear to be light to moderate. The project area has experienced low beetle-caused mortality over the past few years, mostly of large yellow pines. This mortality was likely caused by bark beetles infesting trees stressed from density competition and drought.

Figure 2 Mortality of old growth occurred several years ago.

Although older pine engraver beetle activity (Ips species) was observed in a couple of small suppressed trees, there was no current activity.

Treatment Options to Reduce Impact of Dwarf Mistletoe and Bark Beetles

Dwarf Mistletoe

The typical focus of managing mistletoe is to reduce the impacts of mistletoe infection on forested sites. Mistletoe management is a continuous process. New dwarf mistletoe infections take 3- to 5-years (latent period) before producing aerial shoots, so not all infection can be detected and removed during one treatment. At least one treatment will be needed 5 to 10 years after an initial treatment and can be accomplished during regularly scheduled silvicultural or prescribed fire treatments.

Several features of dwarf mistletoes make them ideal candidates for cultural management[i]:

- Dwarf mistletoes require a living host to survive. Mistletoe dies when an infected tree or branch is cut.
- Dwarf mistletoes are commonly restricted to a single host species or a group of closely related species. Non-host species can be favored during stand treatments.
- Dwarf mistletoes have fairly long life cycles and slow spread rates.
- Spread rates average only 1 foot per year. Although birds contribute to long-distance dispersal of seeds, this is rare and of little practical significance from a control perspective.
- Southwestern dwarf mistletoe-infected ponderosa pine trees are generally easy to detect due to the presence of yellow-orange shoots and witches' brooms. Trees in heavily infected stands show signs of short stature, decline, and mortality.

Managing dwarf mistletoe is difficult in stands under uneven-age management because younger trees become heavily diseased from seeds showering down from infected overstory trees. Initially, all infections in the young stand develop directly from seeds produced from overstory trees. Then there is a transition period when infections in the young stand begin to produce seeds that further infect the stand. Subsequently, infection in the young stand progresses outward beyond the range of the seeds produced in the overstory stand. Researchers[ii] [iii] have found nearly all infection in 20 year old stands was found to be attributable to seed produced in the overstory with 80 percent of infected seedlings found within 35 feet of infected overstory trees. In 50-year-old trees, lateral spread accounted for about one-half of the spread in open stands and one-third of the total in dense stands, with distances from the original overstory seed source reaching nearly 80 feet and 65 feet, respectively.

If uneven-aged treatments are to be applied in dwarf mistletoe infected stands, the sites

should have very low levels of mistletoe and the mistletoe dispersed in defined patches. Group selection could be used to effectively remove infected trees and limit spread.

Prescribed burns can also be used to reduce dwarf mistletoe infection levels. Heavily infected trees have been shown to have reduced post-burn survival rates compared to lightly infected or non-infected trees[iv v]. Limbs located in the lower crowns of trees are killed during fire. Since dwarf mistletoe infections are generally more abundant in the lower crowns of infected trees, infection levels are decreased by the death of lower limbs.

Bark Beetles

No stand hazard rating models have been developed for pine engraver beetles species attacking ponderosa pine, primarily because beetle populations are driven by drought and factors leading to large amounts of slash. Stand hazard rating for Dendroctonus bark beetles of ponderosa pine involves measures of tree size, stand or group density (basal area), and the percent of host trees within the stand. In general, ponderosa pine stands that have an average DBH greater than 12 inches and a basal greater than 120 ft2/acre are considered at high risk to bark beetle attack[vi,vii,viii]. On the Coconino NF, stands that have less than 80 square feet of basal area per acre should be considered the lowest risk. Also, in order to protect residual trees from attack from ips beetles all fresh cut “slash” (cut tree trunks, limbs, and trimming debris) must be created and treated properly to keep beetles from breeding in it and moving into adjacent residual green trees[ix].

Recommendations

Treatments to mitigate mistletoe impacts should be integrated with other treatment activities such as reducing stand susceptibility to fire or insect outbreaks. Uneven-aged treatments should only be considered in non-dwarf mistletoe infested or lightly infested stands that have well defined infection patches in which group selection can be used to target the removal of infected trees. Even-aged treatments are recommended in moderately to heavily dwarf mistletoe infected stands. Moderately infected stands that are adequately stocked can be thinned by targeting the more severely infected trees while also emphasizing the most vigorously growing trees. Increasing space between trees helps limit spread because seeds of dwarf mistletoe are explosively released and typically travel 10 to 40 feet from a fruit bearing plant. This reduces infection levels while still allowing trees to grow to maturity. Heavily infected stands should either receive a regeneration treatment, such as a shelterwood, or be deferred from treatment. Regardless of the emphasis on even-aged or uneven-aged stands, monitoring for follow-up treatments in 5 to 10 years is recommended.

Thinning treatments can help to reduce the overall susceptibility of stands to bark beetle attack in the long term as well as improve overall tree vigor, lessen risk of catastrophic wildfire, and improve vegetative species diversity. High stand density reduces both individual tree and stand vigor which increases stand susceptibility to mortality from bark beetles. Excess competition from smaller trees greatly increases the risk of loss of the scattered large yellow pine. Continuous interlocking crowns and well-developed

fuels ladders leaves vegetation on these sites at a high risk of loss from catastrophic wildfire.

Thinning from below has been experimentally demonstrated to increase the resistance level of the residual mature pine overstory[x]. Thinning slash may pose a short-term risk to residual trees in the thinning units or surrounding areas depending on the timing of thinning, local population of pine engraver beetles, and site and environmental factors such as site quality and precipitation. Careful monitoring of beetle populations associated with these thinning projects should be implemented.

If you have any questions, please contact me at (928) 556-2075.

/s/ Mary Lou Fairweather
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